COMPOSITES

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CLASSIFICATION OF COMPOSITES

Composite material is a material composed of two or more distinct phases (matrix phase and dispersed phase) and having bulk properties significantly different form those of any of the constituents.

→**Matrix phase**

The primary phase, having a continuous character, is called matrix. Matrix is usually more ductile and less hard phase. It holds the dispersed phase and shares a load with it.

→**Dispersed (reinforcing) phase**

The second phase (or phases) is embedded in the matrix in a discontinuous form. This secondary phase is called dispersed phase. Dispersed phase is usually stronger than the matrix, therefore it is sometimes called reinforcing phase.

Many of common materials (metal alloys, doped Ceramics and Polymers mixed with additives) also have a small amount of dispersed phases in their structures, however they are not considered as composite materials since their properties are similar to those of their base constituents (physical properties of steel are similar to those of pure iron).

There are two classification systems of composite materials. One of them is based on the matrix material (metal, ceramic, polymer) and the second is based on the material structure:

Classification of composites

I . **Based on matrix material**

    1. **Metal Matrix Composites (MMC)**

Metal Matrix Composites are composed of a metallic matrix (aluminum, magnesium, iron, cobalt, copper) and a dispersed ceramic (oxides, carbides) or metallic (lead, tungsten, molybdenum) phase.

    2. **Ceramic Matrix Composites (CMC)**

Ceramic Matrix Composites are composed of a ceramic matrix and embedded fibers of other ceramic material (dispersed phase).

3. Polymer Matrix Composites (PMC)

Polymer Matrix Composites are composed of a matrix from thermoset (Unsaturated Polyester (UP), Epoxiy (EP)) or thermoplastic (Polycarbonate (PC),Polyvinylchloride, Nylon, Polysterene) and embedded glass, carbon, steel or Kevlar fibers (dispersed phase).

Classification of composite materials II
(based on reinforcing material structure)

4. Particulate Composites

Particulate Composites consist of a matrix reinforced by a dispersed phase in form of particles.

1. **Composites with random orientation of particles.**

2. **Composites with preferred orientation of particles.** Dispersed phase of these materials consists of two-dimensional flat platelets (flakes), laid parallel to each other.

5. Fibrous Composites

1. **Short-fiber reinforced composites.** Short-fiber reinforced composites consist of a matrix reinforced by a dispersed phase in form of discontinuous fibers (length < 100*diameter). I. **Composites with random orientation of fibers.**

II. **Composites with preferred orientation of fibers.**

2. **Long-fiber reinforced composites.** Long-fiber reinforced composites consist of a matrix reinforced by a dispersed phase in form of continuous fibers. I. **Unidirectional orientation of fibers.**

II. **Bidirectional orientation of fibers (woven).**

6. Laminate Composites

When a fiber reinforced composite consists of several layers with different fiber orientations, it is called **multilayer (angle-ply) composite**.

Reference:
http://www.substech.com/dokuwiki/doku.php?id=classification_of_composites